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THE EARTHQUAKE IN THE RIVIERA.

WE always feel doubtful whether it is right for us to describe or write about earthquakes.

Japan can start and support a Seismological Society, but England has nothing of the kind—indeed, to our knowledge, there is no seismometer at work in the British Isles, and no publication in which the scattered notices of earthquake shocks are collected and arranged. Our learned contemporary, *Nature*, does more perhaps than all other journals put together, but its treatment of the subject is miserably poor as compared with what might and should be done.* Why does not some one take up the subject and start a Vulcanological Society? Nobody can doubt its being interesting; we are strongly of opinion that it would be useful, and such phenomena as the earthquake in Spain, that at Ischia, and the present one in the Riviera, would bring in plenty of subscribers. Such a society should have correspondents near each of the principal and more accessible volcanoes, and should publish a record of the proceedings of each; and this, collated with records of seismometers, and of all the notes of earthquake shocks which could be collected, would soon bring order out of chaos, and enable the value of many theories and of many reputed facts to be ascertained.

However, the Society has yet to be formed, and meanwhile we may, perhaps, be excused for following our old custom and giving a few particulars.

TIME.

The first point we have attacked is, When did the principal shock occur? Owing to the very different modes of time reckoning adopted in the Riviera, we have had considerable difficulty in finding out which records were correct. There were three principal shocks roughly at 5.45, 5.54, and 8.30 a.m., Paris time, on February 23rd.

* Of course that wonderful book, *Whitaker's Almanac*, gives a list, and beats *Nature* in regard to arrangement, but it is packed so tight as to be too small for old eyes to read, and many events are dismissed in one line.

The most trustworthy records of the time of the first shock, and some conclusions therefrom, are given in the following table :—

	h. m. s.	Corresponding Greenwich mean time. h. m. s.	Distance from assumed centre in Gulf of Genoa miles.	If shock at 5.30, and travelling 4,200 miles an hour. h. m. s.	Difference from reported time. m. s.
Observatory, Moncalieri, Turin	6.22	=5.30. 4...	110	5.31.34...	+1.30
Milan electric clocks stopped at	6.25	=5.33. 4...	120	5.31.43 ..	—1.21
Basle Observ. clocks stopped at	6.42.50	=5.34.30...	250	5.33.34...	—0.56
Lyons, magnetic trace disturb. at	5.55	=5.35.44...	250	5.33.34 .	—2.10
Paris ,, ,, ,, ,,	5.45	=5.35.40...	480	5.36.51...	+1.11
Greenwich ,, ,, ,,		5.38 ...	700	5.40. 0...	+2. 0
Kew Observatory ,, ,, ,,	5.40	=5.40 ...	700	5.40. 0...	0
			Mean		—0.2

This table shows several great irregularities ; for instance, the time reported for Milan is three minutes later than for Turin, and for Lyons two minutes later than for Basle, yet each pair of places is at approximately the same distance from the centre of disturbance. The fact is that, as with the Essex Earthquake,* the records of time are not accurate enough to indicate correctly the rate of motion of an earthquake shock which is from 3,000 to 10,000 miles an hour. As regards the magnetic instruments, the time scale is generally about 0·6 inch an hour, therefore at an earthquake velocity of 6,000 miles an hour, we have only one-tenth of an inch of paper for 1,000 miles of travel of the shock. Hence, the wonder is *not* that there are discrepancies, but that they are so small.

As regards the last two columns, our readers may attach to them just what value they please ; we have a strong impression that the figures in the last column but one are true within a minute, but, if so, the shock must have travelled very slowly, for 4,200 miles an hour, or 70 miles a minute is, we believe, a very low rate for the travel of an earthquake shock.

LOCALITY.

As already intimated, the centre of disturbance is believed to have been under the Gulf of Genoa, and serious damage is almost confined to the portion of Italy ceded to Napoleon III. in 1860, to Piedmont and to Liguria. The serious cases are in a still smaller area, viz., in the Riviera, between Savona and Monte Carlo, about 66 miles from W.S.W. to E.N.E., and extending, perhaps, 20 miles inland. Fortunately, much of this area is mountainous and without population, but still the loss of life and destruction of property has been serious. The latest returns that we have seen give the following results :—

* "The East Anglian Earthquake of 1884." Macmillan and Co., 1885.

	Dead.	Wounded.
Alassio	3	8
Albenga	—	30
Albissola	3	12
Bajardo	230	30
Bussano	80	27
Castellano	41	65
Ceriana	5	12
Diano Castello	35	10
Diano Marina	180	65
Montaldo	1	3
Noli	16	12
Oneglia	23	150?
Pompeiana	5	7
Porto Maurizio	1	10
Savona	11	—
Taggia	8	14
Triora	4	9
Total	646	464

We do not, for a moment, suggest that these figures are correct; they bear in the disproportion of dead to wounded strong evidence to the contrary; but, doubtless, they are as near the truth as the "2,000 killed" of some daily journals.

STRUCTURAL DAMAGE.

We now pass to the consideration of structural damage, and here originally there was much difficulty caused by gross exaggeration and by contradictory statements. Time enough has, however, now elapsed to allow of the facts being approximately ascertained, though we are still doubtful upon many points, *e.g.*, about 200 persons were killed in one church, but whether it was at Bajardo or at San Romolo, or a similar catastrophe occurred at both, we have not been able to decide.

Albissola.—Many houses cracked from top to bottom.

Antibes.—No damage.

Aurigo.—Church fell in.

Avignon.—Shock felt, but no damage.

Bajardo.—A mountain village (2,500 feet) about 10 miles N.W. of San Remo. Parish church fell in during early service, and 220 dead bodies were subsequently removed; 120 houses had to be pulled down.

Bar, near Grasse.—A village seven miles N. of Cannes. Three cottages crushed by the fall of an old tower.

Berne.—Slight shock.

Bordighera.—Houses badly shaken, but not much serious damage.

Bouyon.—A village 10 miles N.W. of Nice. The nine o'clock shock here was more violent than the early one, therefore, although about 80 houses were destroyed or damaged, no lives were lost.

Bussano.—A village about three miles from San Remo suffered severely; the number of persons killed is variously reported as from 80 to 250 out of a total population of from 500 to 800. One report states that nothing was left standing except the steeple of the church.

Cannes.—Shock felt and slight damage to furniture, but nothing at all serious.

Castellaro.—A village about six miles N. of San Remo was much damaged and 41 inhabitants were killed; the church is said to have fallen in.

Castillon.—A village about four miles N.W. of Mentone very badly injured.

Cerriana.—This is about six miles N.W. of San Remo and about two miles E. of Bajardo, and was considerably injured.

Cervo.—Serious damage.

Cipulina.—Several houses fell.

Corsica.—Two sharp shocks; no damage reported.

Costabelle, near Hyères.—Shock scarcely felt.

Diano Castello.—A village about 14 miles N.E. of San Remo and near the coast, suffered very severely. Reports vary as to the number of houses left standing, but none states that more than two-thirds were left, and most of them say that all, or all but one, fell.

Diano Marina.—This is an adjoining village on the shore of the Mediterranean, and it suffered, if possible, more than Diano Castello; even the strongly-built railway station was in ruins.

Digne.—The former capital of Provence. Sharp shock, but only a few small cracks produced.

Genoa.—Damage very slight.

Geneva.—Shock felt.

Grenoble.—A few floors and ceilings cracked and some furniture upset.

Lausanne.—Slight shock.

Leghorn.—Slight shock.

Lyons.—Shock very slight.

Marseilles.—Sharp shocks, some houses cracked.

Mentone.—This may be said to be the only one of the Riviera health resorts at which the shock was as bad as, or worse than, that in the neighbourhood of Colchester in 1884. No deaths were reported, but there were many wounded, and the old town and many of the modern villas suffered severely. It is said that 250 houses were destroyed, and that ten hotels were ordered to be closed as being unsafe.

Milan.—Electric clocks stopped at 6.25 a.m.

Monaco.—Shock insignificant, and very little damage.

Nice.—This city has suffered far more from panic and weak nerves than from the earthquake. There were very few deaths,* and few wounded. One church tower fell, and another was cracked, two large hotels were so cracked that the guests left, and many cornices, chimney pots, &c. fell; but the real injury to Nice was mental rather than physical, and now that the bulk of their customers have left, the tradesmen of Nice probably see the folly of not opening their shops because a few chimney pots had been thrown down during the night.

Nîmes.—House bells rung and clocks stopped.

Oneglia.—A station on the coast, eight miles N.E. of San Remo, was considerably injured; several houses fell, and more were damaged.

Richmond, Surrey.—A gentleman who was lying in bed awake, felt the shock at about 5.45 a.m., and mentioned the fact to his wife long before any tidings had arrived from Italy.

* We know of only one.

Rome.—Shock only just perceptible.

San Remo.—No loss of life, and no serious damage, except to some old houses, and to one small hotel.

Savona.—Two houses were said to have fallen, and many others to be on the point of doing so, but a gentleman who on Feb. 28th visited every quarter of the town, says that he could find only a few small cracks.

Toulon.—Slight shock.

Turin.—Church bells rang, and a few cornices fell.

Valence.—Clocks stopped.

Vence.—A village six miles N. of Antibes, a roof fell and killed a child.

Ventimiglia.—Scarcely any damage.

Vienna.—Shock just perceptible.

PREVIOUS EARTHQUAKES AT NICE.

The last issue of Dr. Onimus's *Midi Medical* contains several interesting articles, especially one entitled "Faits exagérés et erronés," in which he speaks of the panic at Nice much as we have done. Another article of importance is the translation into French of an Italian MS. in the Library of Nice, giving a list of earthquakes felt in that city during several centuries. There are very few, so we give all the dates but curtail the descriptions :—

1212.—Great earthquake, and several houses crushed by stones which rolled down from the hills. [We think that this must refer to houses in the environs, not in the city. ED. M. M.]

1564.—July (or Aug.) 20. Violent shock in the neighbourhood of Nice, and extending to Villafranca, but nothing is said of any person being killed or building damaged.

1612.—Jan. 31. Sharp shock at 3 p.m. but no damage.

1618.—Jan. 14, 16 and 18, at 5 p.m. (probably a muddle of dates). A sharp shock which did much damage to buildings, but not one person was injured.

1637.—Nov. 29. Sharp shock, nobody hurt.

1644.—Feb. 15. A shock felt at Marseilles, throughout Provence, and as far as Nice. Fourteen market towns were destroyed, and many persons buried.

1752.—Feb. 16. On the first day of Lent there was a shock at 4.45 a.m., which caused many of those who were in bed to rush into the streets, where they met many others who had been dancing when the shock came, and had also rushed into the streets. Nothing is said as to any damage having occurred.

The parallelism between this event and that of 1887 is extremely remarkable—each on Ash Wednesday, each in the early morning, and probably each of nearly equal violence, or shall we say weakness, for with a population (not counting visitors) of 55,000, there was, we believe, but one death from the recent shock.

WHIRLWIND NEAR DOVER.

AN unusual occurrence is reported from Guston, a small village near Dover. On March 9th, about two p.m., the inhabitants were alarmed by a loud rushing noise, as of a heavy downpour of rain. This was immediately followed by a storm of wind, which, rushing along with terrific force, lifted fowls, ducks, and sticks from the ground, carried them round and round, and to a great height in the air. Large pieces of timber and stones were also lifted and dropped at some distance from the point where they lay. Trees were stripped of branches, but no serious damage to property is recorded. A second gust of wind was felt, though it was not so strong as the previous one. The condition of the atmosphere at the time was very peculiar, the sky being overcast and the air sultry. The wind storm passed from inland towards the sea. A similar occurrence took place about the same time last year, when the storm was also felt at Deal and Walmer.—*St. James's Gazette.*

REVIEWS.

Jahrbuch der Meteorologischen Beobachtungen der Wetterwarte der Magdeburgischen Zeitung, 1884. Magdeburg, 1886. 58 pp., 4to, 12 plates.

THIS volume fully maintains the excellence attained in the previous years, and the contents and admirable arrangement are essentially the same as before, with some important additions. The observations taken at 8^h, 2^h and 8^h are published in the international form, and *in addition*, the *daily* temperature means for 1881-4, have been calculated from the above hours according to the formula adopted by the *Deutsche Seewarte* :—

For May to August.	For September to April.
$\dfrac{\left(\frac{8+8}{2}\right) + \frac{(\text{Max.} + \text{Min.})}{2}}{2}$	$\dfrac{8+8}{2} + \dfrac{(8+2+8}{3}$ / 2

The continuous curves of air-pressure and the registration of sunshine are reproduced, but we confess that we shall not be surprised if this method of representation is eventually abandoned in favour of the more simple numerical process, as has been the case in other countries owing to the great expenditure of time and money demanded by the former process. The hourly records of Wind-Direction and Velocity; and observations of temperature and humidity at an altitude of 105 ft., Earth Temperature, Solar radiation, Evaporation, &c., for specified hours, are given as before, and, *in addition*, the observations made with an Actinometer of the Arago-Davy principle. These are of considerable interest. Some very useful discussions

are promised for the next volume, *e.g.*, on the important question of determining the daily means of temperature from various combinations of hours as compared with those obtained from hourly observations, with a view of deducing the most reliable values with the least trouble to the observer; and a comparison of the temperature observations at 105 ft. and 6 ft. above the ground, in order to show the influence of an elevation of 100 ft. upon the daily means. We congratulate Dr. Assmann upon the results already attained in this great and important undertaking, and look forward with confidence to still further achievements in the future. For fuller details respecting the methods employed, and the apparatus, we may refer to a notice in this Magazine for December, 1884. (Vol. xix. p. 169).

J. S. H.

Ergebnisse der Meteorologischen Beobachtungen im Jahre, 1885. *Herausgegeben von dem Königlich Preussischen, Met. Inst. durch* WILHELM VON BEZOLD, *Direktor*. A. Asher & Co., Berlin, 1887. 4to., lxx-246 pp., and two maps.

IT is often said that a good start has much to do with final success. If that be true, Dr. von Bezold has a bright future before him, for no one can examine this volume without feeling that it is, in design and execution, exactly what the first volume of a new series should be. There is a just recognition of the importance of continuity by its resemblance to its precursors, but at the same time there are so many new features that on the whole we are much charmed with it.

After a brief introduction, Dr. von Bezold gives lists of stations, their latitudes, longitudes, altitudes, times of observation, &c. He then gives details as to the organization of the office, its separation from the Statistical bureau, and its establishment in its new premises. This is followed by an article, in which, though it only occupies eight pages, Dr. Hellmann gives a capital summary of the work of the Royal Prussian Meteorological Institute from its foundation in 1847 to its re-organization in 1885. An alphabetical list of all stations in Prussia at which observations have been made since 1847, with particulars as to the period, the instruments, the observers, &c., is followed by various summaries and diagrams (on the plan adopted many years ago by Moritz of Tiflis), showing at a glance the life-history of each station.

Appendix No. 2 contains a description of the instruments issued at different epochs, into which Dr. Hellmann (with true German thoroughness) has packed an immense amount of useful information. The facts which would most astonish Englishmen are the excessive prices paid in past years for self-registering thermometers, and their consequent rarity in Germany until a quite recent date.

Appendix No. 4 is a very useful one, giving a list of all the official

publications of the old office and a summary of the principal contents of each.

Appendix No. 6 gives a list of monographs on the meteorology and climatology of various German towns, arranged alphabetically according to the names of the towns.

The first set of tables gives the observations taken at 6 a.m., 2 p.m., and 10 p.m. daily during 1885 at eight stations, one being the Schneekoppe, at an altitude of 5,246 ft. The second set gives monthly summaries on the International pattern for about 150 stations, and this is followed by many others respecting wind, rain, &c. We may call special attention to a table of the temperature at Breslau for every month of 95 consecutive years, 1791 to 1885. The volume closes with tables of monthly rainfall communicated by the members of the Association for the Promotion of Agricultural Meteorology during the years 1881 to 1885, and a map of these stations; which could easily be made a little clearer in the next issue; it requires only to be made a little more like the map which it immediately follows.

ROYAL METEOROLOGICAL SOCIETY.

THE usual monthly meeting of this society was held on Wednesday evening, Feb. 16th, at the Institution of Civil Engineers, 25, Great George Street. Mr. W. Ellis, F.R.A.S., President, in the chair.

Mr. E. T. Edwards, Mr. D. Fitzgerald, C.E., Mr. T. B. Groves, F.C.S., and Mr. W. W. Midgley were elected Fellows of the society.

The adjourned discussion on the Hon. R. Abercromby's paper 'On the Identity of Cloud Forms all over the World; and on he general principles by which their indications must be read" was resumed; and the following papers were read :—

(1.) "Remarks concerning the Nomenclature of Clouds for ordinary use," by Prof. H. H. Hildebrandsson, Hon. Mem. R.Met.Soc.

(2.) "Suggestions for an International Nomenclature of Clouds," by the Hon. R. Abercromby, F.R.Met.Soc. Both Prof. Hildebrandsson nd Mr. Abercromby have paid great attention to the question of the forms of clouds, and, having recently conferred together, they have agreed to recommend for international use the following ten principal varieties, viz. : — High-level clouds: cirrus, cirro-stratus, cirro-cumulus; middle-level: strato-cirrus, cumulo-cirrus; and low-level: cumulus, stratus, strato-cumulus, nimbus and cumulo-nimbus.

(3.) "The influence of Weather on the proportion of carbonic acid in the air of plains and mountains," by Dr. W. Marcet, F.R.S., and Mons. A. Landriset. The authors give an account of some experiments which they have made on the proportion of carbonic acid in the air at Geneva and on the summit of the "Dole," the highest point of the Jura chain, the difference in altitude being 4,193 feet. The result of these experiments is (1) that in fine

clear weather, on a mountain chain of moderate alpine altitude and in the adjoining valley or plain, the atmosphere holds the same mean proportion of carbonic acid at both places; and (2) that when the summit of a mountain chain is in a fog, a circumstance which frequently happens in an alpine district, the air in the fog contains a smaller proportion of carbonic acid than it would hold in fine clear weather.

The Secretary, Dr. Tripe, read a letter received from Sir F. Abel, organising secretary to the proposed Imperial Institute, inviting the council to draw the attention of the Fellows to the undertaking, with the view of their contributing towards it. The President stated that copies of the letter and of the accompanying paper, explanatory of the scheme, would be forwarded to each Fellow.

THE FLOODS.

SOME parts of New South Wales have been visited by rather too much moisture. Owing to the flood in the Clarence River several houses have been swept away at Ulmarra and Copmanhurst. The losses of stock in these district have been enormous, and nearly all the settlers and tradespeople will lose more or less. Numbers of small landslips have taken place, some involving the wreck of buildings of various kinds. The wharves and sheds at South Grafton have been carried away, while several houses have also disappeared from the same place. Fully forty or fifty boats were engaged in rescuing those who were hemmed in by the flood waters, and but for the vigorous efforts made a large number of people, would undoubtedly have lost their lives. Many were on the point of succumbing when taken out of their half-filled houses. A half-caste was drowned in trying to cross one of the streets in Grafton. Next day the flood waters slowly receded; many of the stock, which were at first supposed to be drowned, were found all right, after having been carried miles away by the flood. Some houses, which had been swept away from South Grafton, were found three miles further down the river. The losses of the storekeepers in South Grafton alone are estimated at £10,000. Immense damage was done to the maize crops. The losses of the farmers are roughly estimated at £100,000. The Government have granted £500 towards repairing the streets of Grafton and £350 towards the Relief Fund.

There have been more floods in Queensland, bringing with them, it is to be regretted, loss of life and great injury to property. The latest reports from the Logan and the Albert rivers show that in one place about 260 persons were reduced to a state of starvation, and were destitute of clothing or shelter. On the Upper Logan the watercourses rose 120 feet. The Waterford bridge was all right, but the Logan railway bridge, which cost £12,000, was swept away. Mr. John Brown, sawmiller, was drowned at Swan Creek, near

Warwick. The water rose there 30 feet in half an hour. The shores of Moreton Bay were lined with dead cattle, pigs, and fish of all descriptions. At a meeting called by the Mayor of Brisbane, on January 28th, for the relief of the sufferers, there were present the Colonial Treasurer, Minister of Works, Sir T. McIlwraith, Bishop Webber, several Members of Parliament, and influential citizens. It was decided to form a general fund, and a committee was appointed. Sir S. W. Griffith sent £100 from Melbourne.—*Colonies and India.*

REMARKABLE SHOWERS AND MARVELLOUS METEOROLOGY.

To the Editor of the Meteorological Magazine.

SIR,—Since writing the letter which appeared in your issue of November last, I have come across some records of wonderful showers in the translation of M. Flammarion's "L'Atmosphère," edited by James Glaisher, F.R.S., one at least of which is, I think, worthy of transcription.

"In 1688 they [*i.e.* cockchafers] formed so dense a cloud in Galway, that the sky was darkened to the distance of a league, and the peasants had a difficulty in finding their way about. They destroyed all vegetation, so that the country around had the look of winter. Their voracious jaws made a noise like that caused by the sawing of a thick piece of timber, and in the evening the flapping of their wings resembled the distant rolling of a drum. The unhappy Irish were compelled to cook and eat them for want of other food."

In his preface the Editor says: "I believe the volume will be found to be readable, popular, and accurate, and it covers ground not occupied by any one work in our language."—Yours faithfully,

H. SOWERBY WALLIS.

25, *Northwood Road, Highgate, March 10th*, 1887.

RAINFALL OF ANTIGUA.

The rainfall of Antigua is registered at the Library in the city of St. John. The following shows the rainfall for six years :—

1881—66·85	1882—42·65	1883—69·14
1884—53·49	1885—51·15	1886—48·14

LARGE HAILSTONES.

A hailstorm of quite a phenomenal character passed over Riet Vlei, Cape Colony, the other day. Numbers of hailstones fell in rapid succession as large as cricket balls, one of them measuring 4 inches by $3\frac{3}{4}$ inches, and several of them weighing $\frac{1}{2}$ lb. to $\frac{3}{4}$ lb. each. —*Colonies.*

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, AUGUST, 1886.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0–100	°	°	inches		0–10
England, London	88·4	30	44·6	3	73·9	54·6	54·3	75	124·4	39·0	·76	12	5·2
Malta	92·3	12	65·4	4	84·1	69·5	65·4	69	149·0	...	·00	0	1·6
Cape of Good Hope	83·0	1	35·2	10	64·0	47·8	49·3	87	...	...	3·88	10	6·8
Mauritius	76·6	21	57·7	14	74·6	62·6	56·4	67	129·1	48·2	·74	2	4·8
Calcutta	89·8	22*a*	75·5	26	87·5	78·4	78·3	87	160·6	74·3	8·93	23	8·1
Bombay	86·3	5	73·9	15	84·4	77·0	75·1	83	146·4	71·9	10·69	25	8·2
Ceylon, Colombo	85·7	24	73·1	2*c*	83·6	76·1	71·8	76	143·0	67·0	1·74	11	6·7
Melbourne	68·1	9	32·9	24	57·7	42·5	41·5	74	116·4	24·3	2·45	15	6·2
Adelaide	73·1	29	38·6	23	61·4	47·4	44·5	69	128·1	30·1	3·09	24	6·4
Wellington	...	...	...	...	...	...	...	...	...	...	...	...	...
Auckland	62·0	12	36·0	28	57·7	46·6	45·2	84	125·0	28·0	5·68	29	7·0
Jamaica, Kingston	96·2	18	70·5	1*d*	91·8	73·4	74·0	81	...	...	12·24	21	6·3
Barbados	84·0	15*b*	69·0	16	82·0	73·0	73·4	80	147·0	...	17·87	23	7·0
Toronto	87·9	11	46·3	5	74·8	56·5	57·1	74	...	40·0	2·63	9	5·2
New Brunswick, Fredericton	89·2	27	45·0	19	73·6	53·2	56·1	77	...	...	2·79	14	5·8
Manitoba, Winnipeg	103·0	24	31·7	31	78·4	49·9	52·7	67	...	...	1·17	10	5·2
British Columbia, Victoria	79·0	6	39·0	23	70·0	49·0	...	...	...	...	·73	4	...

a And 23. *b* And 22, 27, 30. *c* And 8, 14. *d* And 2, 28.

REMARKS, AUGUST, 1886.

MALTA.—Mean temp. 76°·2; mean hourly velocity of wind 8·3 miles. Severe shocks of earthquake were felt on 14th and 15th and on 27th there were very severe shocks at 11 p.m., lasting two minutes and a quarter. J. SCOLES.

Mauritius.—Rainfall ·96 in. and mean temp. 0°·7 below the average; mean hourly velocity of wind 11·1 miles, extremes 26·5 miles and 1·9 miles; prevailing direction E.S.E. Fore and after glows were more intense than usual. C. MELDRUM, F.R.S.

Melbourne.—Mean temp. of air and of dew point both 0°·6, and pressure ·195 in. below average; mean humidity, average; rainfall ·58 in., and amount of cloud slightly above average. Prevailing wind N, strong on 11 days; heavy dew on 2 days, hoar frost on 2, sleet and H on 1 day, L on 2 days. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean pressure (29·886 in.) the lowest on record and ·239 in. below the average of 29 years. Rainfall nearly an inch above the average; mean amount of cloud excessive; mean temp. about the average. C. TODD.

Auckland.—Stormy, wet, and disagreeable. Mean temp., average; pressure considerably below; rainfall considerably above the average. T. F. CHEESEMAN.

JAMAICA.—Cyclone on 20th doing much damage. R. JOHNSTONE.

BARBADOS.—Mean temp. (76°·8), about the average; rainfall excessive, never having been exceeded during 35 years. Prevailing wind N.E.; mean hourly velocity 7·7 miles, extremes 12·5 miles and 3·2 miles. TSS on 3 days; 15 days were overcast. Between 6 a.m. and 7 a.m. of 17th a hurricane raged at St. Vincent (90 miles W.), causing great destruction to buildings, with loss of life. R. BOWIE WALCOTT.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, SEPT., 1886.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	TotalRain. Depth.	TotalRain. Days.	Aver. Cloud.
	°		°		°	°	°	0–100	°	°	inches		0–10
England, London	84·2	1	42·2	17	68·7	52·5	51·2	75	117·7	33·8	1·73	11	5·1
Malta	89·7	9	64·5	14	81·9	69·2	66·5	75	140·7	...	4·09	11	3·1
Cape of Good Hope	88·4	23	39·8	18	67·2	49·9	52·1	86	...	...	2·50	9	5·3
Mauritius	78·3	21	60·0	24	76·3	64·1	58·3	69	130·4	48·2	·85	15	5·3
Calcutta	89·5	4	74·2	29	87·1	78·0	78·3	88	162·0	72·0	13·93	24	7·8
Bombay	87·8	24	74·3	4	85·1	76·8	75·5	83	149·1	71·2	6·54	19	6·1
Ceylon, Colombo	86·8	21	71·3	6	84·7	76·2	72·5	75	146·0	64·3	8·07	14	6·8
Melbourne	78·9	30	36·6	12	65·4	45·7	43·3	65	128·1	28·0	1·30	10	5·0
Adelaide	82·5	30	40·1	27	69·9	52·0	45·2	56	141·2	29·3	·69	11	4·4
Wellington	...	...	...	...	...	...	...	...	...	...	...	...	...
Auckland	62·0	28*a*	41·5	14	58·6	47·6	45·5	74	128·0	32·0	3·05	19	7·4
Jamaica, Kingston	95·8	16	68·5	13	93·3	72·6	72·6	79	...	...	2·55	12	5·7
Barbados	87·0	22	70·0	8	83·0	73·0	74·0	82	146·0	...	14·80	24	7·0
Toronto	83·9	8	40·1	15	67·8	49·7	52·9	79	...	33·0	3·83	17	4·9
New Brunswick, Fredericton	87·7	8	29·5	23	62·6	41·4	46·5	73	...	...	2·88	14	5·2
Manitoba, Winnipeg	82·1	1	23·5	30	60·3	37·6	41·9	75	...	...	4·73	13	5·0
British Columbia, Victoria	80·0	11	35·0	27	65·8	45·6	...	...	...	...	1·59	7	..

a And 30.

REMARKS, SEPTEMBER, 1886.

MALTA.—Mean hourly velocity of wind 7·4 miles; R unusually heavy; temp. of dew point above average. TSS on 4 days, L on 3 other days. J. SCOLES.

Mauritius.—R ·85 in. and temp. 0°·4 below average. Mean hourly velocity of wind 11·7 miles; extremes 26·0 miles on 11th, and 2·1 miles on 2nd; prevailing direction E.S.E. C. MELDRUM, F.R.S.

Melbourne.—Mean temp. of air 2°·3 and pressure ·043 in. above average; temp. of dew point 0°·3; humidity 6; cloud 1·1 and R 1·03 in. below average. Prevailing wind N., strong on 9 days; heavy dew on 7, T and L on 2, L on 6.
R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 4°·0 above the average and the highest recorded. R considerably below average. C. TODD.

Auckland.—Beginning and middle of month stormy and wet, end fine, but cool and cloudy. Mean temp. and R slightly below average. T. F. CHEESEMAN.

BARBADOS.—Mean temp. (77°·2) average; R 43 per cent. above average. Wind N.E. on 22 days, S.E. on 3, S.W. on 5; mean hourly velocity 6·4 miles. T and L on 6 days, severe on some. R. BOWIE WALCOTT.

FREDERICTON.—Aurora on 1 night. TSS on 2 days.

WINNIPEG.—Aurora on 6 nights. TSS on 3 days, first S on 29th.

SUPPLEMENTARY TABLE OF RAINFALL, FEBRUARY, 1887.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	·89	XI.	Castle Malgwyn	1·23
,,	Margate, Birchington	·37	,,	Rhayader, Nantgwillt	1·84
,,	Littlehampton	·95	,,	Carno, Tybrith	1·68
,,	Hailsham	·72	,,	Corwen, Rhug	1·26
,,	Ryde, Thornbrough	·97	,,	Port Madoc	2·38
,,	Alton, Ashdell	·99	,,	I. of Man, Douglas	1·26
III.	Oxford, Magdalen Col.	·67	XII.	Stoneykirk, Ardwell Ho.	·99
,,	Banbury, Bloxham	·70	,,	New Galloway, Glenlee	3·11
,,	Northampton	·60	,,	Melrose, Abbey Gate	·99
,,	Cambridge, Beech Ho.	·62	XIII.	N. Esk Res. [Penicuick]	2·80
,,	Wisbech, Bank House.	·69	XIV.	Ballantrae, Glendrishaig	1·85
IV.	Southend	...	,,	Glasgow, Queen's Park.	3·00
,,	Harlow, Sheering	·56	XV.	Islay, Gruinart School.	3·05
,,	Rendlesham Hall	·43	XVI.	St. Andrews, Pilmour Cot	1·12
,,	Diss	·55	,,	Balquhidder, Stronvar.	8·93
,,	Swaffham	·64	,,	Dunkeld, Inver Braan.	2·30
V.	Salisbury, Alderbury	·71	,,	Dalnaspidal H.R.S.	7·49
,,	Warminster	·64	XVII.	Keith H.R.S.	·63
,,	Calne, Compton Bassett	·89	,,	Forres H.R.S.	·93
,,	Ashburton, Holne Vic.	1·81	XVIII.	Strome Ferry H.R.S.	6·37
,,	Holsworthy, Clawton	·76	,,	Tain, Springfield	1·40
,,	Hatherleigh, Winsford.	...	,,	Loch Shiel, Glenaladale	10·08
,,	Lynmouth, Glenthorne.	1·04	,,	S. Uist. Ardkenneth	4·48
,,	Probus, Lamellyn	1·01	,,	Invergarry	10·35
,,	Wincanton, Stowell Rec.	·59	XIX.	Lairg H.R.S.	
,,	Taunton, Lydeard Ho	·48	,,	Forsinard H.R.S.	1·88
,,	Wells, Westbury	·46	,,	Watten H.R.S.	1·12
VI.	Bristol, Clifton	·70	XX.	Dunmanway, Coolkelure	3·67
,,	Ross	·40	,,	Fermoy, Gas Works	1·26
,,	Wem, Clive Vicarage	·42	,,	Tralee, Castlemorris	3·90
,,	Cheadle, The Heath Ho.	·45	,,	Tipperary, Henry Street	·94
,,	Worcester, Diglis Lock	·57	,,	Newcastle West	·82
,,	Coventry, Coundon	·54	,,	Miltown Malbay	2·61
VII.	Melton, Coston	·55	XXI.	Gorey, Courtown House	·72
,,	Ketton Hall [Stamford]	·60	,,	Navan, Balrath	·92
,,	Horncastle, Bucknall	·68	,,	Mullingar, Belvedere	1·36
,,	Mansfield, St. John's St.	·53	,,	Athlone, Twyford	1·36
VIII.	Macclesfield, The Park.	·75	,,	Longford, Currygrane	2·43
,,	Walton-on-the-Hill	·72	XXII.	Galway, Queen's Coll.	2·77
,,	Lancaster, South Road.	...	,,	Clifden, Kylemore	3·73
,,	Broughton-in-Furness	3·35	,,	Crossmolina, Enniscoe	5·36
IX.	Wakefield, Stanley Vic.	·35	,,	Collooney, Markree Obs.	3·11
,,	Ripon, Mickley	1·69	XXIII.	Rockcorry	1·36
,,	Scarborough	...	,,	Warrenpoint	1·12
,,	East Layton [Darlington]	1·09	,,	Newtownards	...
,,	Middleton, Mickleton	1·18	,,	Belfast, New Barnsley	1·45
X.	Haltwhistle, Unthank	1·48	,,	Cushendun	3·69
,,	Shap, Copy Hill	4·24	,,	Bushmills	1·67
XI.	Llanfrechfa Grange	1·13	,,	Stewartstown	1·41
,,	Llandovery	1·59	,,	Buncrana	2·61

FEBRUARY, 1887.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1870–9	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	·48	— 1·16	·12	17	5	54·1	5	22·6	17	14	21
II.		Maidstone (Hunton Court)...	·51	— 1·11	·26	18	5	...	...	...	...	...	...
,,		Strathfield Turgiss	·69	— 1·06	·24	17	9	54·7	5	21·0	17	18	21
III.		Hitchin	·63	— ·97	·18	2	7	53·0	4, 5	22·0	16	19	...
,,		Winslow (Addington)	·64	— 1·17	·16	2, 17	7	54·0	27	16·0	17	20	21
IV.		Bury St. Edmunds (Culford)	·59	— 1·18	·15	1	8	55·0	4	14·0	16	19	...
,,		Norwich (Cossey)	·57	— 1·18	·17	1	5	...	...	...	...	...	...
V.		Weymouth(LangtonHerring)	·71	...	·22	2	8	52·0	23	25·0	17	15	...
,,		Barnstaple.....	·59	— 2·60	·23	17	6	54·0	4*a*	30·0	9	...	...
,,		Bodmin	·92	— 3·95	·37	2	9	53·0	3, 4	23·0	17	10	20
VI.		Stroud (Upfield)	·74	— 1·51	·30	2	8	54·0	24	23·0	16	17	...
,,		ChurchStretton(Woolstaston)	·56	— 1·94	·25	2	8	52·5	5	23·0	10	16	21
,,		Tenbury (Orleton)	·44	— 2·03	·26	2	5	55·0	3	20·5	10	16	20
VII.		Leicester	·48	...	·16	2	8	57·0	27	23·0	17	19	25
,,		Boston	·41	— 1·37	·20	2	4	58·0	6	21·0	16	11	...
,,		Hesley Hall [Tickhill].....	·31	...	·11	17	7	56·0	27*b*	22·0	8	19	...
VIII.		Manchester (Ardwick).....	·43	— 1·76	·12	17	6	52·0	23*c*	25·0	10	12	...
IX.		Wetherby (Ribston Hall) ...	·89	— 1·26	·26	3	8	...	...	...	...	...	...
,,		Skipton (Arncliffe)	2·87	— 1·77	·85	2	17	53·0	27	28·0	26	...	...
,,		Hull (Beverley Road)	·41	— 1·53	·10	13	9	53·0	23*c*	23·0	8	17	20
X.		North Shields	·38	— 1·46	·20	2	6	56·2	24	20·0	10	13	14
,,		Borrowdale (Seathwaite).....	9·51	— 1·94	3·20	22	13	52·5	28	18·0	10	14	...
XI.	WALES.	Cardiff (Ely).....	1·48	— 2·18	·56	2, 3	8	...	...	...	...	...	...
,,		Haverfordwest	1·33	— 3·12	·34	2	10	52·0	3*d*	19·0	9	18	25
,,		Plinlimmon (Cwmsymlog) ...	1·55	...	·34	17	10	...	...	...	...	...	...
,,		Llandudno.....	·55	— 1·74	·13	5	10	56·1	3	24·5	10	6	...
XII.	SCOTLAND.	Cargen [Dumfries]	1·98	— 1·83	·68	24	8	52·8	18	19·2	9	9	...
,,		Jedburgh (Sunnyside).....	·41	— 1·35	·20	3	4	56·0	23*c*	18·0	9, 10	10	...
XIV.		Old Cumnock	2·99	+ ·13	·70	22	15	53·0	28	23·0	10*i*	15	...
XV.		Lochgilphead (Kilmory).....	5·57	+ 1·18	·97	22	18	...	...	...	...	...	...
,,		Oban (Craigvarren)	6·15	...	1·09	22	16	56·6	26	28·0	9	3	...
,,		Mull (Quinish).....	5·17	...	·95	23	15	...	...	...	...	...	...
XVI.		Loch Leven Sluices	2·90	— ·06	·70	5	8	...	...	...	...	...	...
,,		Arbroath	1·06	— 1·10	·44	2	8	54·0	23	24·0	9	7	...
XVII.		Braemar	1·86	— ·81	·64	2	14	57·0	28	19·2	10	11	22
,,		Aberdeen	·89	...	·27	2	12	54·0	23	22·0	9	6	...
XVIII		Lochbroom	4·26	...	·82	23	17	...	...	...	...	...	...
,,		Culloden	1·59	+ ·54	...	...	...	55·0	27	30·0	7, 9	4	29
XIX.		Dunrobin	1·35	...	·35	17	8	55·0	28	27·0	9	8	...
,,		Kirkwall (Swanbister)..... ..	2·06	...	·32	24	19	51·3	27*b*	30·5	3, 17	...	...
XX.	IRELAND.	Cork (Blackrock)	1·32	— 3·27	·32	1	11	54·0	17	26·0	10	8	...
,,		Dromore Castle	2·33	...	·35	24	13	56·0	25	26·0	10	...	...
,,		Waterford (Brook Lodge) ...	·59	...	·14	1	9	52·0	22*g*	26·0	10	6	...
,,		O'Briensbridge (Ross)	1·40	...	·35	22	12	52·0	...	25·0	11	10	...
XXI.		Carlow (Browne's Hill)	·85	— 2·07	·34	2	12	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	·54	— 1·62	·14	2	11	57·1	27	26·0	10	5	19
XXII.		Ballinasloe	1·62	— ·89	·36	22	17	51·0	22*h*	22·0	10	15	...
XXIII		Waringstown	·95	— 1·30	·28	2	12	57·0	22*h*	23·0	10	16	17
,,		Londonderry (Creggan Res.).	3·23	...	·85	4	19	...	...	...	...	...	...
,,		Omagh (Edenfel)	2·17	— ·11	·65	2	14	53·0	23*c*	22·0	9	12	20

a And 5, 25, 28. *b* And 28. *c* And 24. *d* And 4, 5. *g* And 23, 28. *h* And 23. *i* And 11.
+ Shows that the fall was above the average ; —that it was below it.

METEOROLOGICAL NOTES ON FEBRUARY, 1887.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—On the whole a cold dry month, with local fogs, rather severe frosts at night, and a slight rainfall, constituting about the best possible conditions for the land. Purple dead nettle, daisy and lesser periwinkle in flower on 4th, chickweed and blue birds-eye on 5th; first primrose in the open on 18th; skylark heard on 5th.

ADDINGTON.—A dry cold month, with the least rainfall of any February for years, except February 1886, when only ·63 in. fell. From 7th to 20th, very cold N.E. wind prevailed. Pressure was particularly high on 7th, 8th and 9th, S on 1st, high wind on 3rd. Fog on 16th, 17th and 22nd, and dense on 20th.

CULFORD.—A very dry month, with low night temp. Out-door operations progressed favourably. Fog on 6th and 26th.

LANGTON HERRING.—A month of splendid weather. Mean temp. (37°·6) 3°·0 below the average of 15 years. Mean pressure higher than for any month since January 1882. From 6th to 17th, the wind was E.N.E. or N.E. On the 18th, there was a fog, but on the whole the weather was remarkably clear.

BODMIN.—A very singular February. I have never known a February with so little R, so little wind and so much sunshine. Mean temp. 38°·6.

WOOLSTASTON.—A pleasant, seasonable month, with a good deal of severe frost. Mean temp. 37°·8.

ORLETON.—A very dry and cold month, with frequent severe frosts at night and many bright sunny days. Mean temp. 3°·2 below the average of 26 years. Rainfall less than that of any February for the last 56 years, not excepting even 1860, when ·48 in. fell. There was no S. Pressure was generally high and steady.

LEICESTER.—A very cold month, with an exceptionally small rainfall.

MANCHESTER.—The month was fine and favourable for agriculture, with temp. lower than that of January.

HULL.—A fine, dry month, with sharp night frosts; pressure generally high. The driest February since 1863.

WALES.

HAVERFORDWEST.—The month commenced wet, but from the 5th to the 16th, strong E. breezes prevailed with severe frost; a week of broken milder weather followed, and from the 24th to the end it was again cold and frosty. Rainfall very slight.

LLANDUDNO.—The month did not fulfil the old adage, "February fill the dyke either with the black or white." On the contrary, the weather was remarkably fine, with a large amount of sunshine, particularly from 6th to 13th, and from the 22nd to the close. S was conspicuous by its absence, and the rainfall was barely a quarter of the average. There were two cyclonic storms, one, on the 3rd, of great force from S.W., the other, on the 23rd, of a much less violent character. With these exceptions the weather was generally calm with high pressure. The mean temp. (42°·1) was within half a degree of the average. The mean daily range of temp. (10°·7) was 1°·6 and the monthly range was 4°·7 above the average.

SCOTLAND.

CARGEN.—The most remarkable feature of the month was the unusually high pressure. Mean temp. (39°·4) rather below the average.

JEDBURGH.—Rainfall less than in any other February for 23 years. For the first ten days the temperature was lower than in January, but after that it gradually rose, and spring flowers were in full bloom at the close. High S.W. wind prevailed on 22nd, 23rd and 24th, otherwise the weather was singularly quiet.

OBAN.—Stormy periods occurred at the beginning and end of the month. The temperature was mild, and spring vegetation was much advanced at the close. A very fine aurora was seen on 12th. From the 22nd to 24th, very heavy R fell, accompanied by gales. A very heavy gale without R blew on 26th.

BRAEMAR.—A month of unusually fine weather. T from 2 p.m. to 4 p.m. on 18th.

ABERDEEN.—The month was fine and dry throughout. Rainfall nearly an inch and-a-half below the average. Prevailing wind S.W. Aurora on 19th.

LOCHBROOM.—The first five days were very stormy and disagreeable, with winter in every sense, but from the 6th to the 17th, the weather was lovely, more like summer than spring, thence to the end there was much variety, with a strong gale on 23rd and 24th. S on 1st, 5th, and 18th. Sleet on 5th, 19th and 20th.

CULLODEN.—The month generally was fine, with little frost; the period from 4th to 19th was dry and favourable for labour.

IRELAND.

BLACKROCK.—From 1st to 6th showery, with high wind at times, followed by nine dry and bright days, then showery again. The driest February for 22 years, except 1867 and 1868, when 1·32 in. and 1·00 in. fell. Pressure unusually high. Mean temp. (42°·1) 0°·5 below the average of 11 years. Wind N.W. or S.W. on 18 days, E. or S.E. on 10 days. Fog on 15th.

DROMORE.—Very fine and calm, with no high winds; vegetation good.

WATERFORD.—A remarkably dry February. The next driest in 28 years was in 1877, when more than twice as much R was registered. The average of the period is 3·50 in., or very nearly six times as much as the fall this month.

O'BRIENSBRIDGE.—Unusually fine for February. Some strong S. winds prevailed, without R. There was no S, and the frosts were slight.

DUBLIN.—Showery and squally at first, the weather soon became quiet, dry and fine. From the 4th to the 21st, the pressure was uninterruptedly high. The driest February for very many years. The weather on the whole resembled that of the preceding month, although the extremes were less marked. Mean temp. slightly below the average. Aurora on 12th; fog on 10 days; high winds on 11 days, gales on 3rd and 24th. Mean humidity 81; mean amount of cloud 5·2; prevailing winds W., S.W., and N.E.

EDENFEL.—With the exception of two short broken periods in the first and third weeks, the weather of February was ideal in its character. With just sufficient frost to check vegetation, the days were, as a rule, calm and frequently clear and balmy, and such as would not have been out of place in the Riviera.

METEOROLOGICAL PAMPHLET EXCHANGE.

It is with much pleasure that we find that it is to so high an authority as Dr. Hann that we owe the first support of the proposal made in our last number. Dr. Hann has, however, not sent old papers, but copies of a recent one, as set out below :—

No of Copies.	Title.	Price, Post Free.
9	DR. HANN.—Bemerkungen zur täglichen Oscillation des Barometers	2½d.